

Payment will be made under:

Item No. 514	Epoxy Coated Bar Reinforcement Steel	Per pound (kilogram)
Item No. 514	Epoxy Coated Superstructure Reinforcement Steel, Bridge No. _____	Per lump sum

514.5.01 Adjustments

A. Additional Splices

Additional splices requested to accommodate lengths suitable for coating equipment will be subject to the Engineer's approval. Additional splices will be at the Contractor's expense.

B. Additional Expenses

Additional expenses incurred by the Contractor or suppliers because of the requirements in this Specification are considered incidental. These expenses are included in the Contract Price per pound (kilogram) or per Lump Sum.

Section 515—Handrail-Ferrous Metal and Pipe

515.1 General Description

This work consists of placing handrail and posts made of ferrous metal pipe. It shall include setting anchorages, preparing bearing areas, and painting or galvanizing the handrail, whichever the Plans require.

515.1.01 Definitions

General Provisions 101 through 150.

515.1.02 Related References

A. Standard Specifications

Section 500—Concrete Structures

Section 501—Steel Structures

Section 535—Painting Structures

Section 645—Repair of Galvanized Coatings

B. Referenced Documents

ASTM A 123/A 123 M

ASTM A 153/A 153 M

515.1.03 Submittals

General Provisions 101 through 150.

515.2 Materials

All materials shall meet the requirements of the following Specifications.

Material	Section
Structural Steel	851
Malleable Iron Castings	854.2.04
Steel Castings	854.2.05
Steel Pipe	847.2.01
Steel Bolts, Nuts, and Washers	852.2.01
Paint	870
Plain Steel Bars—Threaded Ends	852.2.02

515.2.01 Delivery, Storage, and Handling

Handle the rails and posts carefully to minimize damage to shop paint or galvanizing.

515.3 Construction Requirements**515.3.01 Personnel**

General Provisions 101 through 150.

515.3.02 Equipment

General Provisions 101 through 150.

515.3.03 Preparation

General Provisions 101 through 150.

515.3.04 Fabrication

General Provisions 101 through 150.

515.3.05 Construction**A. Fabricate Handrail**

Fabricate handrail as follows. All fabrications shall meet the applicable Specifications of Subsections 501.3.04.H and 501.3.06.C, “Welded Construction.”

1. **Fabrication Material.** Fabricate handrail from plates, shapes, bars, pipe, castings, or from combinations of these materials as shown on the Plan details.
2. **Handrail Not Supported on Concrete Parapets.** When erected bridge handrail will not be supported on a concrete parapet, fabricate the handrail so posts will be plumb.
3. **Stairways on Grades.** On handrail for stairways on grades, use adjustable malleable iron fittings where required or weld the handrails to the posts when specified on the Plans.
4. **Welding Requirements.** Welding shall meet the requirements of Subsections 501.3.04.H and 501.3.06.C, “Welded Construction.”
Grind smooth all welds except fillet welds. Do not grind fillet welds; leave them as they are.
5. **Galvanizing.** Before galvanizing, complete all cutting, welding, and fabrication of rails, posts, bolts, set screws, and other components.

Galvanize material according to the following standards:

Material	Standard
All material except hardware	ASTM A 123/A 123M
Hardware	ASTM A 153/A 153M

6. **Shop Painting.** If metal or pipe handrail, posts, and their component parts will not be galvanized, paint them with the type of shop paint required on the Plans.

All painting shall meet the requirements of Section 535.

B. Construct Handrails

Construction shall meet the applicable Specifications of Subsections 501.3.04.H and 501.3.06.C, “Welded Construction.”

Construct handrail according to the Plan details and as follows:

1. **Set Anchor Bolts.** Set anchor bolts using these guidelines:
 - Set the anchor bolts according to the Plan details and ensure that the bolts have the correct spacing and projection.
Projections shown on the Plans are for flat grades and assume no use of shims.
 - On other grades or where shims are needed, modify the projection shown on the Plans so that after all shims, pads, posts, and washers have been placed, the anchor bolt nut can be screwed completely onto the anchor bolt.

- If the projection is too short, lengthen or replace the bolt (at the Contractor's expense) as directed by the Engineer.
2. **Prepare Bearing Areas.** Before placing the posts, prepare bearing areas using these guidelines to obtain full contact between the posts or shims and the concrete:
 - Remove all concrete protrusions.
 - Fill all depressions.
 - Ensure that bearing areas for posts are true to grade.
 - Finish concrete with the Type IV—Floated Surface Finish specified in Subsection 500.3.05.AB.5, "Type IV—Floated Surface Finish."
 3. **Erect Handrail.** Erect handrail using these guidelines:
 - Make all rails parallel to grade.
 - Where bridge rail will be supported on a concrete parapet, set handrail posts normal to grade.
 - Set other handrail posts and pipe standards plumb. If necessary, use shims under post bases and floor flanges to achieve plumb posts.
 - Tighten the set screws as detailed on the Plans.
 - Tighten anchor bolt nuts to a snug fit with full bearing on the base of the post.
 - When posts and rails are completely bolted into place, ensure that they are true to line and grade.
 4. **Paint Handrail in the Field.** Painting shall meet the Specifications of Section 535.
If metal or pipe handrail, posts, and their component parts are not galvanized, paint them with the type of paint and number of coats required on the Plans.
 5. **Repair Galvanized Coating.** Repair damaged galvanized coatings (at the Contractor's expense) according to Section 645.

515.3.06 Quality Acceptance

General Provisions 101 through 150.

515.3.07 Contractor Warranty and Maintenance

General Provisions 101 through 150.

515.4 Measurement

This work will be measured for payment in linear feet (meters) of accepted handrail. Handrail will be measured along the top rail from out-to-out of the ends of metal rail or from out-to-out of metal end posts, whichever is greater. No deductions will be made for openings at deck expansion joints or at light standards.

515.4.01 Limits

General Provisions 101 through 150.

515.5 Payment

This work will be paid for at the Contract Price per linear foot (meter) for metal or pipe handrail complete in place.

Payment will be made under:

Item No. 515	Ferrous Metal Handrail, Type	Per linear foot (meter)
Item No. 515	Galvanized Steel Pipe Handrail: _____ in (mm) (<u>Type</u>)	Per linear foot (meter)
Item No. 515	Black Steel Pipe Handrail _____ in (mm) (<u>Type</u>)	Per linear foot (meter)

515.5.01 Adjustments

General Provisions 101 through 150.